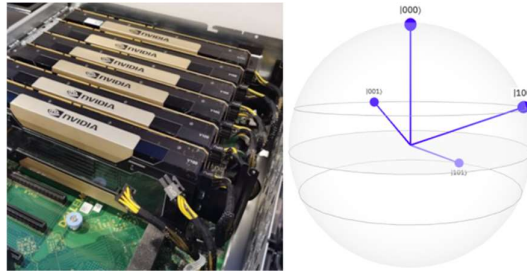


WACQT | Wallenberg Centre for Quantum Technology

Two in one: Work with high-performance computing and quantum computing



Nvidia GPU accelerators and quantum states visualization.

Background

Building a quantum computer is an extremely challenging task and classical simulations on high-performance computing (HPC) solutions play a significant part in this endeavor. A good and performant simulator cannot only help to explore quantum algorithms, but it can also serve as a steppingstone for building a higher-level infrastructure for a cloud-based quantum computing stack. One such simulator is Qiskit Aer from IBM. It belongs to a class of generic array-based simulators and its main strength is a support for noise models and GPU acceleration. This simulator is currently used on personal laptops and we would like to have it deployed on HPC as a cloud-based service. To this end, a suitable higher-level infrastructure already partially exists in our lab, however, it primarily targets our physical experiments.

Problem description

The goal of this project is to extend an existing cloud-based quantum computing stack at QTL with a new backend: the Qiskit Aer simulator. The simulator is available in source code and needs to be compiled and deployed on a computer cluster which features GPU accelerators. Making the simulator available through QTL's SW ecosystem will then require designing and implementing suitable higher-level control layers.

Workflow

Key milestones of the project:

- 1) Deployment of multiple instances of Qiskit Aer on the Alvis cluster at Chalmers
- 2) Design & implementation of a control layer as a part of the software at QTL
- 3) Test over-the-cloud functionality against quantum circuits generated by Qiskit Terra

Team size

3-6 students

Literature

<https://github.com/Qiskit/qiskit-aer>

Student background

E, F, TM, D, IT

Supervisors

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